**WHAT IS CLAIMED IS**

1. A complex single sideband zero IF down-converter frequency demodulator or frequency discriminator/comparator, comprising:

means for receiving and splitting a local oscillator (LO) signal of frequency $\omega_0$ to two components: the in-phase component and the quadrature component;

means for receiving and splitting an input signal of carrier frequency $\omega_c$ to two components: the in-phase component and the quadrature component;

means for multiplying each one of the said in-phase and quadrature LO signal components with each one of the said in-phase and quadrature input signal components, for generating a total of four different converted input signals;

means for combining (adding or subtracting) in two pairs the said four converted signals, producing two lower single sideband signals: the in-phase signal $I^-(t)$ and the quadrature signal $Q^-(t)$;

means for delaying each of the said in-phase $I^-(t)$ and quadrature $Q^-(t)$ signals by substantially same time delay $\tau$, providing respective delayed baseband signals $I^-(t-\tau)$ and $Q^-(t-\tau)$;

means for multiplying the said delayed signals with the said un-delayed signals, to generate two multiplication products $I^-(t-\tau)Q^-(t)$ and $I^-(t)Q^-(t-\tau)$;

means for combining (subtracting) the said two multiplication products, providing the demodulated baseband signal $BB(t)$;

means for outputting the said demodulated baseband signal;

means for generating a local oscillator signal of frequency $\omega_0$, which is related to frequency $\omega_c$ and time delay $\tau$ by equation $(\omega_c - \omega_0)\tau \cong n\pi$, where $n = 0,\pm1,\pm,2,\ldots$.

2. The frequency demodulator of Claim 1, wherein the input signal is frequency modulated by transmitted information, having the average frequency equal to $\omega_c$ and the instantaneous frequency deviation proportional to the transmitted information.

3 The frequency discriminator/comparator of Claim 1, wherein the input signal is a signal derived from a signal source having a dominant frequency $\omega_c$, which is being compared with the LO frequency $\omega_0$.

4. The frequency demodulator or discriminator/comparator of Claim 1, wherein the multiplication operation is replaced with exclusive OR (XOR) logic function, and related signals are bi-level (digital) signals.

5. The frequency demodulator or discriminator/comparator of Claim 1, wherein the input signal and/or the LO signal is first scaled in frequency by division with an integer number in a frequency divider.

6. A complex single sideband zero IF down-converter frequency discriminator/comparator, comprising:

means for receiving and splitting a local oscillator (LO) signal of frequency $\omega_0$ to two components: the in-phase component and the quadrature component;

means for receiving and splitting an input signal having a dominant frequency $\omega_c$ to two components: the in-phase component and the quadrature component;

means for multiplying each one of the said in-phase and quadrature LO signal components with each one of the said in-phase and quadrature input signal components, for generating a total of four different converted input signals;

means for combining (adding or subtracting) in two pairs the said four converted signals, producing two lower single sideband signals: the in-phase signal $I^-(t)$ and the quadrature signal $Q^-(t)$;

means for delaying only one of the two said signals by time delay $\tau$, providing one delayed base band signal, $I^-(t-\tau)$ or $Q^-(t-\tau)$;

means for multiplying the said delayed signal with one of the said un-delayed signals, to generate one multiplication product, $I^-(t-\tau)Q^-(t)$ or $I^-(t)Q^-(t-\tau)$, providing the baseband signal $BB(t)$;

means for outputting the said demodulated baseband signal;

means for generating a local oscillator signal of frequency $\omega_0$, which is substantially equal to frequency $\omega_c$.

7. The frequency discriminator/comparator of Claim 6, wherein the multiplication operation is replaced with exclusive OR (XOR) logic function, and related signals are bi-level (digital) signals.

8. The frequency discriminator/comparator of Claim 6, wherein the input signal and/or the LO signal is first scaled in frequency by division with an integer number in a frequency divider.

9. The frequency discriminator/comparator of Claim 1, wherein the said frequency discriminator (FD) is switched to a phase detector (PD).

10. The frequency discriminator/comparator of Claim 6, wherein the said FD is switched to a PD.